Biosensor Nanovesicles

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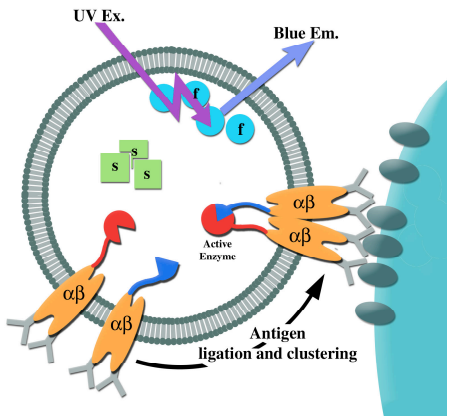
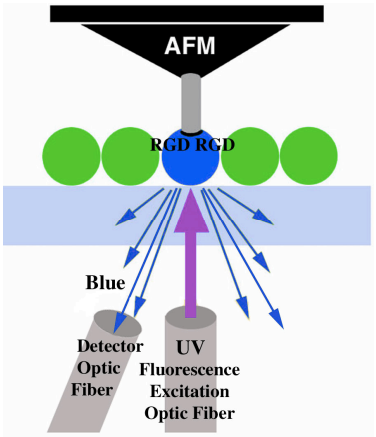


Biosensor Nanovesicle fluorescent signal activation by antibody-induced beta-lactamase fragment complementation



Diagrammatic representation of the experimental AFM/epifluorescence microscopy setup to be used for manipulation of single nanovesicles and detection of responses to stimulation by poly RGD peptides.

Description

We propose to develop technology for a novel biosensor consisting of lipid nanovesicles containing engineered reporter enzymes, for the *in situ* detection of cell surface antigens and other biomolecular markers.

Innovative Claims/NASA Significance

The detection system that we propose to develop will incorporate new technology for generating signals by bringing inactive fragments of an enzyme together inside a lipid vesicle, thereby yielding enzyme activation and signal amplification. Biosensor Nanovesicles may become useful biomedical tools for long-term space travel, in the form of microfluidic diagnostic testing platforms

Biosensor Nanovesicles targeted against cancer-specific antigens, for example, could be used as injectable tracers, that could be detected by fluorescence-based whole body imaging techniques or organ-specific imaging techniques (for detection and diagnosis of lymphoma, breast cancer, lung cancer, and colon cancer).

Biosensor Nanovesicles targeted against bacterial antigens or viral antigens could also provide a powerful tool for diagnosis of a variety of infectious diseases and would be well suited for detection of microbial pathogens that are difficult to isolate by conventional culture techniques.

Plans

To generate DNA constructs encoding chimeric proteins with integrin and β-lactamase complementary enzyme fragments

To express chimeric β-lactamase enzyme fragments in mammalian cells

To induce chimeric β-lactamase enzyme fragment complementation and activation in cells using peptide-mediated integrin clustering

To generate lipid vesicles that contain integrin/enzyme chimeras localized to the membrane

To induce chimeric β-lactamase enzyme fragment complementation and activation in lipid nanovesicles using peptide-mediated integrin clustering

To quantitatively characterize the behavior of single vesicle activation using Atomic Force Microscopy at the nanoscale.